



A.D. 1856 . . . . . N° 2757.

S P E C I F I C A T I O N

OF

JOHN WILLIAM CLARE.

FURNACES, &c.

L O N D O N :

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1857.







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A.D. 1856 . . . . . N° 2757.

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**Furnaces, &c.**

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**LETTERS PATENT** to John William Clare, of White Street, in the Parish of Saint George the Martyr, in the County of Surrey, for the Invention of "IMPROVEMENTS IN PREVENTING, REMOVING, CONSUMING, AND CONDENSING SMOKE AND NOXIOUS VAPOURS, AND IN APPARATUS FOR THOSE PURPOSES."

Sealed the 19th May 1857, and dated the 21st November 1856.

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**PROVISIONAL SPECIFICATION** left by the said John William Clare at the Office of the Commissioners of Patents, with his Petition, on the 21st November 1856.

I, JOHN WILLIAM CLARE, of White Street, in the Parish of Saint George the Martyr, in the County of Surrey, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN PREVENTING, REMOVING, CONSUMING, AND CONDENSING SMOKE AND NOXIOUS VAPOURS, AND IN APPARATUS FOR THOSE PURPOSES," to be as follows:—

I construct a pair of pumps placed vertically, and working alternately, which I apply for drawing the air and smoke from fires and furnaces. The valves of the pumps are so arranged, that the soot which may condense upon them is shaken off by the action of the valves themselves. The vertical position of the cylinders of the pumps, and the motion of the pistons in them keep them free from soot, or the pump or pumps may be placed horizontally, in which case the exit passages are to be so placed that the soot may fall out of them. Or, in lieu of pumps, I employ a rotary fan. The fan case or the pumps stand in a



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cistern of water, by which they are prevented from becoming injuriously heated, and a supply of hot water is thus obtained, which may be used for supplying a steam boiler, or for other purposes. The pumps or fan may be made of galvanized iron or other suitable material, and they are driven by a weight and clockwork, or by a steam engine or any other source of power. The smoke 5 or products of combustion are either blown out into the atmosphere or into a chimney, or into a vessel of water where the smoke is condensed, or into or by the fire, and then up another flue or to any required place. The apparatus, however, gives such a command of the draught of the furnace, that the combustion is rendered more perfect, and the smoke is partially or wholly 10 consumed in the furnace and flues. The excellence of the draught when applied to a steam boiler furnace, allows of the flues being made much longer and carried round the boiler several times, thus completing consuming the smoke, and increasing the effect of the fuel. In condensing or consuming the noxious vapours given off in factories and other buildings, I draw away the 15 vapours from such places by means of the pumps or fan, and I force them through water or through heated pipes, or into a furnace.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said John William Clare in the Great Seal Patent Office on the 21st May 1857.

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**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN WILLIAM CLARE, of White Street, in the Parish of Saint George the Martyr, in the County of Surrey, send greeting.**

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-first day of November, in the year of our Lord 25 One thousand eight hundred and fifty-six, in the twentieth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said John William Clare, Her special licence that I, the said John William Clare, my executors, administrators, and assigns, or such others as I, the said John William Clare, my executors, administrators, and assigns, should at any time 30 agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN PREVENTING, REMOVING, CONSUMING, AND CONDENSING SMOKE AND NOXIOUS VAPOURS, AND IN 35 APPARATUS FOR THOSE PURPOSES," upon the condition (amongst others) that I, the



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said John William Clare, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great  
5 Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John William Clare, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following  
10 statement thereof, reference being had to the accompanying Drawing, and to the figures and letters marked thereon, that is to say:—

I construct a pair of pumps placed vertically, and working alternately, which I apply for drawing the air and smoke from fires and furnaces. The valves of the pumps are so arranged, that the soot which may condense upon them is  
15 shaken off by the action of the valves themselves. The vertical position of the cylinders of the pumps, and the motion of the pistons in them keeps them free from soot; or, the pump or pumps may be placed horizontally, in which case the exit passages are to be so placed that the soot may fall out of them; or, in lieu of pumps, I employ a rotatory fan. The fan case or the pumps  
20 stand in a cistern of water, by which they are prevented from becoming injuriously heated, and a supply of clean hot water is thus obtained, which may be used for supplying a steam boiler, or for other purposes. The pumps or fan may be made of galvanized iron or other suitable material, and they are driven by a weight and clockwork, or by a steam engine, or any other source  
25 of power. The smoke or products of combustion are either blown out into the atmosphere or into a chimney, or into a vessel of water, where the smoke is condensed, or to any required place. The apparatus, however, gives such a command of the draught of the furnace, that the combustion is rendered more perfect, and the smoke is partially or wholly consumed in the furnace and flues.  
30 The excellence of the draught when applied to a steam boiler furnace allows of the flues being made much longer, and carried round the boiler several times, thus completely consuming the smoke and increasing the effect of the fuel. In condensing or consuming the noxious vapours given off in factories and other buildings I draw away the vapours from such places by means of the pumps or  
35 fan, and I force them through water or through heated pipes, or into a furnace.

Figure 1 is a vertical section, and Figure 2 is a plan of a pair of pumps and apparatus constructed according to my Invention. The same letters refer to similar parts in each Figure. A, A, are the cylinders or barrels of the pumps; B, B, are the pistons; C, C, are the piston rods working through guides D, D,



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and connected by slings or forked connecting rods E, E, to the two opposite cranks F, F, on the shaft or spindle G; H is a pulley on the shaft G, which is driven by a strap from a steam engine, or any source of power. Each cylinder A stands on a box I connected to an inlet pipe J and an outlet K, provided with valves L and M. Both outlets communicate with one box N, 5 from which a pipe O ascends into a vessel P, and is covered by a bell-shaped vessel Q; R and S are two diaphragms of wire gauze or perforated plates fixed between the bell Q and the outer vessel P; T is a plate with larger perforations fixed in the upper part of the vessel P, which is covered over and provided with an outlet pipe or chimney U. The cylinders A, A, and boxes I, I, 10 are placed in a cistern V, which is filled with water. The vessel P is about half filled with water. As the water evaporates or is drawn off more water is added, or the water is continually supplied by a ball-cock, or otherwise.

The inlet pipes J, J, of this apparatus are connected to the flue of the furnace of a steam boiler or other furnace, and the shaft G is caused to 15 revolve. The gases or products of combustion are drawn through the valves L by the alternate ascent of the pistons B, B, and are then forced out through the valves M into the box N, and up the pipe O. They then descend between the pipe O and bell Q, from the bottom of which they escape into the water, and ascend through the wire gauze diaphragms, which divide them into a 20 multitude of fine streams or bubbles. Any soot contained in the gases is thus washed out or condensed by the water, and the purified gases then pass away by the outlet pipe or chimney U. The plate T prevents the water from splashing up against the top of the vessel.

The pistons are packed by metallic packing, consisting of one or more rings 25 divided at one part. As the pistons descend, they push down any particles of soot which may condense in the cylinders. This soot falls into the soot boxes I, I. The valves L and M are placed perpendicularly or nearly so, and as they drop against their seats the soot falls off them. The soot from the valve L falls down the pipe J, or into the box I, while that from the valve M falls into 30 the box I or into the outlet K, from which it is removed from time to time by a rake introduced at a door W in the box N. The water in the cistern V prevents the pumps from being injured or destroyed by the heat. The pumps may be employed to force the products of combustion through water, as herein-before described, or they may force them directly into a chimney or into the atmo- 35 sphere. The apparatus shown in Figures 1 and 2 is shewn with two pumps, but three or more pumps may be used in a similar manner. The draught or velocity of the current of air may thus be rendered very regular.

In lieu of employing reciprocating pumps surrounded with water, I some-



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times employ a fan or centrifugal pump surrounded with water, as shewn in transverse section in Figure 3, and in longitudinal section in Figure 4. A, A, is the fan case; B, B, are the blades of the fan mounted on the spindle or shaft G, which is driven by a strap on the pulley H; J, J<sup>1</sup>, are the inlet  
5 pipes, and K is the outlet. The pipes and fan and fan case are inclosed in a cistern V, which is filled with water. Two modes of constructing the inlet pipes are shewn, either of which may be employed. The inlet pipe J is traversed by a pipe *a*, through which passes the spindle G. A portion of this pipe *a* is surrounded by the water in the cistern V, and is thus kept cool.  
10 When the fan is at work, a current of air is drawn in between the pipe *a* and the spindle G, which is thus prevented from becoming overheated at the journal which runs in the bearing *b*. The spindle G may also be made hollow, and pierced with holes at the part which is within the case A. A current of air will then be drawn through the spindle. The portion of the tube *a* which  
15 traverses the inlet pipe J, serves to shield the spindle G from the direct action of the heat. It may be prolonged within the fan case, as shewn by the dotted lines, and it may itself be protected from the heat by a fire clay tube or casing, or by a loose iron tube or casing if required.

The inlet pipe J<sup>1</sup> is constructed in a similar manner, excepting that the  
20 whole of the pipe *a* is surrounded with water. Either of these arrangements may be used, or the spindle G may pass through a stuffing box in the side of the cistern V, and another stuffing box in the side of the pipe J or J<sup>1</sup>, in which case the spindle itself will be in contact with the water.

The inlet pipes J, J<sup>1</sup>, are connected to the flue of a furnace, from which the  
25 products of combustion are drawn out by the fan and driven into a chimney or through water, as in the apparatus first herein-before described.

When these pumps or fans are applied to the furnaces or flues of steam boilers, they produce such a powerful exhaustion or draught, that the products of combustion may be drawn through a great length of flues or tubes, and  
30 thus the heat may be nearly all extracted from them, and the combustion may be completed or nearly so before they reach the pumps or fan. In some cases, therefore, the apparatus for condensing the soot by passing the products through water may be omitted.

I am aware that it has heretofore been proposed to employ pumps or fans  
35 for drawing or exhausting the products of combustion from furnaces, but in such cases they were not protected from the action of the heat by being surrounded with water, as herein-before described, and were, therefore, liable to injury from the action of the heat. I am also aware that it has been proposed to force the products of combustion through water, but with very little



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or no effect, because the products of combustion were not subdivided into small streams or bubbles as herein-before described.

Figure 5 is an elevation, and Figure 6 is a vertical section of a set of pumps adapted for ventilating purposes. The pumps are very similar to those shown in Figures 1 and 2, and they are driven by connecting rods E, E, E, connected 5 to cranks F, F, F, arranged at equal angles on the same shaft or line of shafts G. Two or more pumps are employed. The Drawing shews three pumps, and in this case the cranks are set at angles of one hundred and twenty degrees with each other. A, A, A, are the cylinders; B, in Figure 6, is one of the pistons; C, C, C, are the piston rods; D, D, D, are the guides. 10

The shaft G carries a pinion *d*, which is driven by a train of wheels and pinions from a barrel *e*, on which is wound a chain or rope which passes over a pulley in any convenient position, and is attached to a weight. The wheel *f* on the spindle of the barrel *e* is driven by a ratchet, so as to allow of the weight being wound up like that of a clock. The inlet J of each pump is 15 connected with the inlet main J<sup>1</sup>. The outlet K of each pump is connected with the outlet main K<sup>1</sup>. The valves L, M, are made as light as possible, and the pistons are also made light, and they may be packed with leather, or merely made to fit the cylinders without any packing. When the weight is wound up and the apparatus set in motion, it pumps out a continuous stream 20 of air from the inlet main J<sup>1</sup>, and drives it out through the outlet main K<sup>1</sup>. When the air is charged with noxious vapours, it is conducted from the outlet main K<sup>1</sup> through water, as in the apparatus first herein-before described, or into a furnace, or through pipes or retorts heated by a furnace, or through vessels containing lime or lime water, or other purifying or condensing 25 material, according to the nature of the vapours or gases to be condensed or purified. The noxious vapours given off by crowded assemblies of persons in theatres and other buildings, and in hospitals, may thus be removed and consumed or condensed. In a similar manner, sewers and buildings in which noxious vapours are given off from chemical or other operations may be 30 ventilated, and the vapours rendered harmless, or prevented from escaping into the atmosphere.

In some cases it is merely requisite to remove the noxious vapours from the building or place in which they are contained, and drive them out into the atmosphere. I then employ a set of two or more vertical pumps connected to 35 cranks placed at equal angles to each other on the same shaft, and driven by a train of wheels and a weight or spring, as herein-before described in reference to Figures 5 and 6, or driven as herein-after described in reference to Figure 7.

Figure 7 is a perspective view, shewing a method of driving the machines



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by a weight or by power at pleasure. A is a pulley on one of the spindles of a train of wheels, similar to that shewn in Figures 5 and 6; B is a pulley, whose spindle carries another pulley C, which may be driven by a band from a steam engine or other source of power; D is a pulley to which is suspended  
5 the large weight E; F is another pulley carrying a small weight G, which is employed for keeping tight the endless chain or cord H which passes over the pulley A, under the pulley D, over the pulley B, and under the pulley F, returning to the pulley A; I, I, are two fixed stops. The framing of the apparatus is omitted, in order to show the acting parts more clearly.

10 If the pulley A is allowed to move while B remains stationary, the weight E will descend and will drive the machinery connected with A, and will at the same time raise the small weight G. If the pulley B be now caused to revolve in the contrary direction to A, and at a somewhat greater velocity, it will wind up the chain or cord H faster than it is given out by the pulley A. The  
15 weight will thus be raised until it comes in contact with the fixed stops I, I, and the pulley A will then be compelled to revolve at the same rate as B. A ratchet is provided to prevent the pulley B from revolving in the wrong direction when it is no longer being driven. In this way a set of pumps or a fan connected to a steam boiler furnace may be driven during the day by the  
20 steam engine, and may be left at night with the weight wound up. The weight will then serve to drive the pumps or fan the next morning until the fire has burned up and steam is raised in the boiler, and the pumps may then be again driven by the steam engine.

All the pumps or fans herein-before described may be driven in a similar  
25 manner by a train of wheels and pinions and a weight or a powerful spring or springs, or sometimes by the weight, and sometimes by power, as last herein-before described. Pulleys and bands or friction wheels may be substituted for the wheels and pinions if preferred. An escapement and balance or pendulum, or a governor acting on a brake and brake wheel may be employed when  
30 required for regulating the speed of the machines.

Having now described the nature of the Invention, and in what manner the same is to be performed, I wish it to be understood, that I do not claim generally the application of pumps or fans for removing or condensing smoke and noxious vapours; but what I claim is,—

35 First, removing and condensing smoke by exhausting or drawing the products of combustion from the fire or furnace, or other place in which they are contained, by pumps or fans, and forcing them into water through wire gauze or perforated plates, or other equivalent means of dividing them into a multitude of streams or bubbles, as herein-before described.



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Second, preventing, removing, and consuming smoke by increasing and regulating the draught of furnaces by means of a fan or pumps surrounded by water, as herein-before described.

Third, constructing fans surrounded with water casings, and adapted for removing smoke and products of combustion from furnaces, as herein-before 5 described.

Fourth, constructing pumps surrounded with water casings, and having their cylinders or barrels and their valves in a vertical or nearly vertical position, and so arranged that any soot which may condense upon the cylinders or valves may fall off into suitable receptacles, as herein-before described. Also 10 constructing such pumps in combination with apparatus for passing the products of combustion into water through wire gauze or perforated plates, or other equivalent means of dividing them into a multitude of streams or bubbles, as herein-before described.

Fifth, preventing, removing, consuming, or condensing noxious vapours by 15 exhausting or drawing them from the buildings or places in which they are liberated or contained, and forcing them through water, or through heated pipes, or into a furnace by means of pumps, as herein-before described.

Sixth, constructing a set of two or more pumps with their cylinders or barrels and their valves in a vertical or nearly vertical position, and driven by 20 cranks placed at equal angles to each other on the same shaft or line of shafts, which is connected with and driven by a train of wheels and a weight or spring, as herein-before described in reference to Figures 5 and 6, or driven as herein-before described in reference to Figure 7.

In witness whereof, I, the said John William Clare, have hereunto set 25 my hand and seal, this Twenty-first day of May, in the year of our Lord One thousand eight hundred and fifty-seven.

JOHN WILLIAM CLARE. (L.S.)

Witness,

CHARLES COWPER,

20, Southampton Buildings,

Chancery Lane, London.

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LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1857.



FIG. 1.

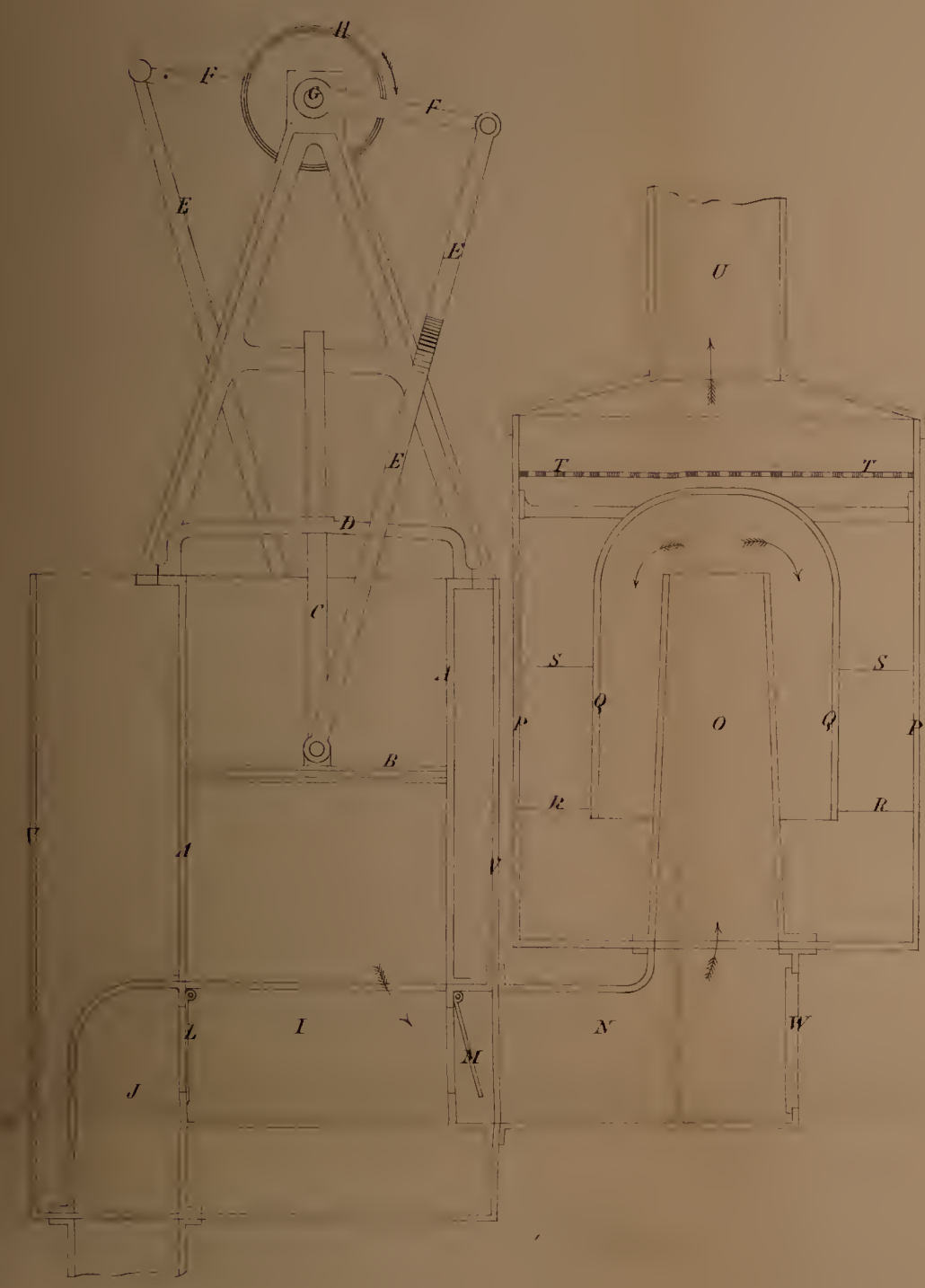


FIG. 6.

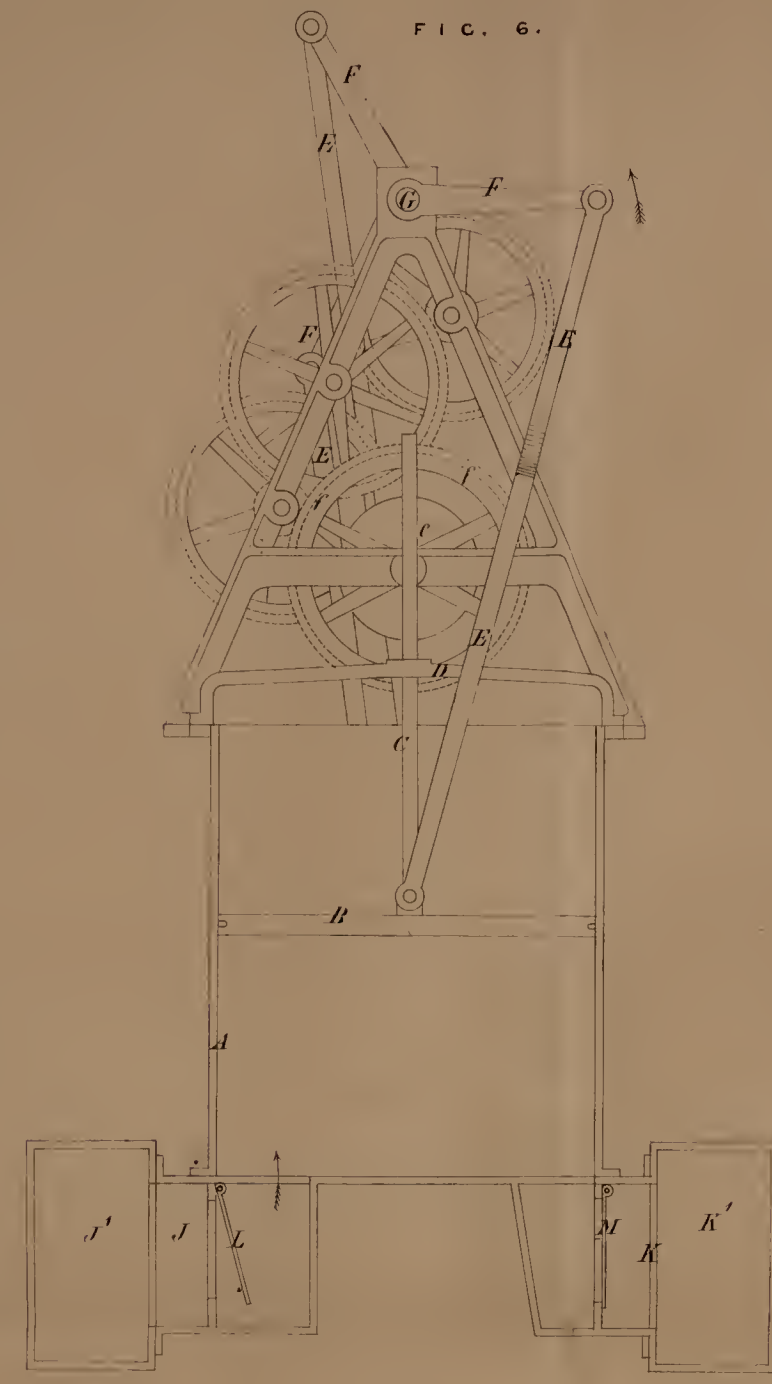


FIG. 5.

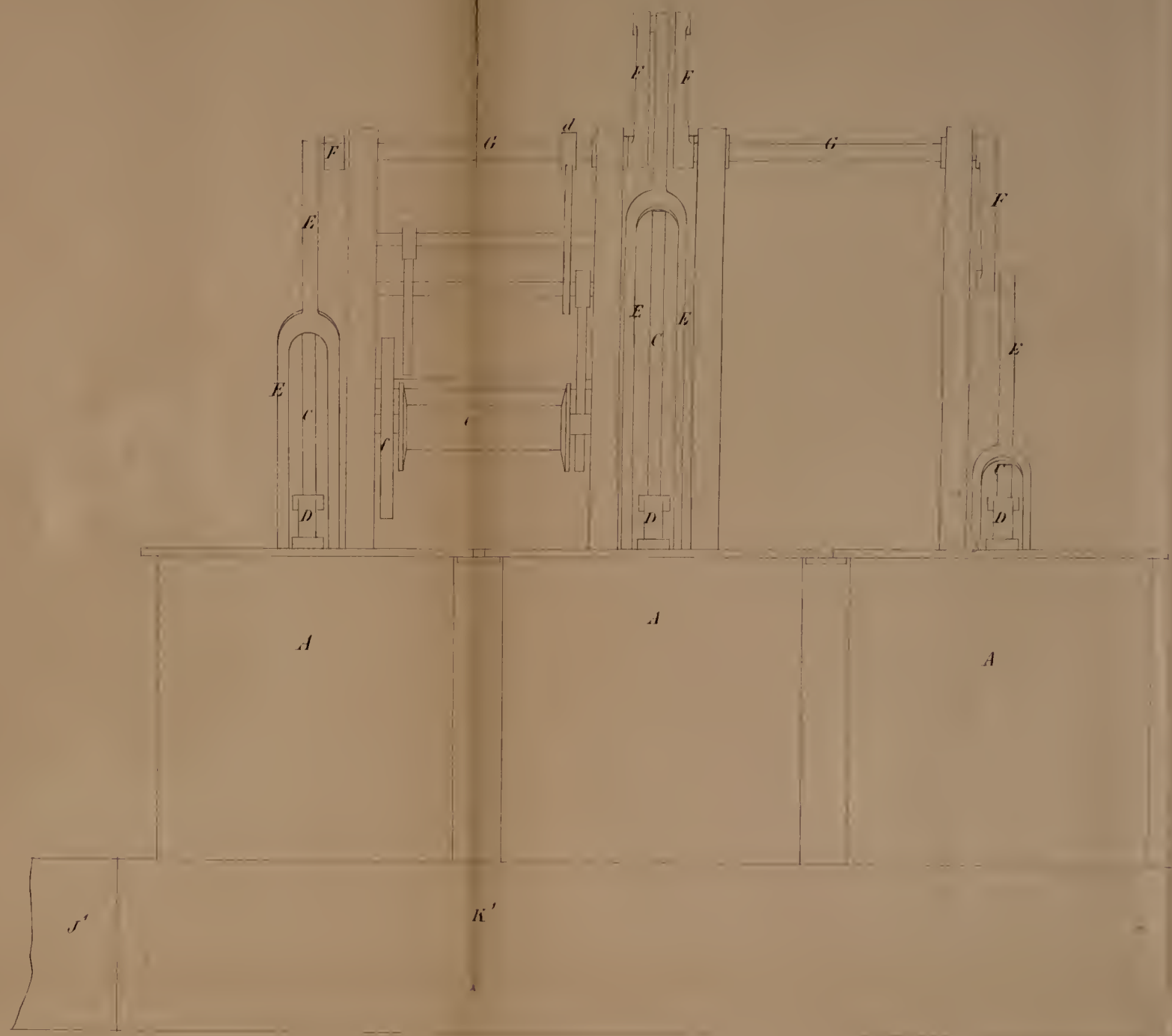


FIG. 2.

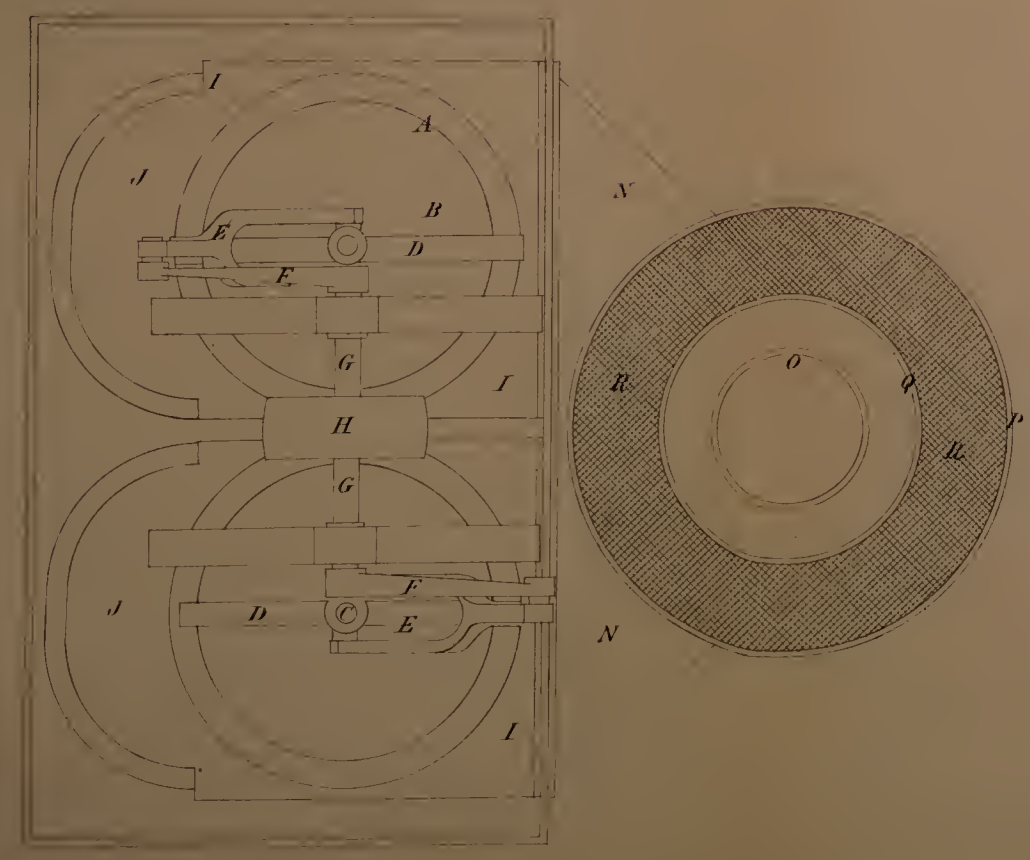


FIG. 7.

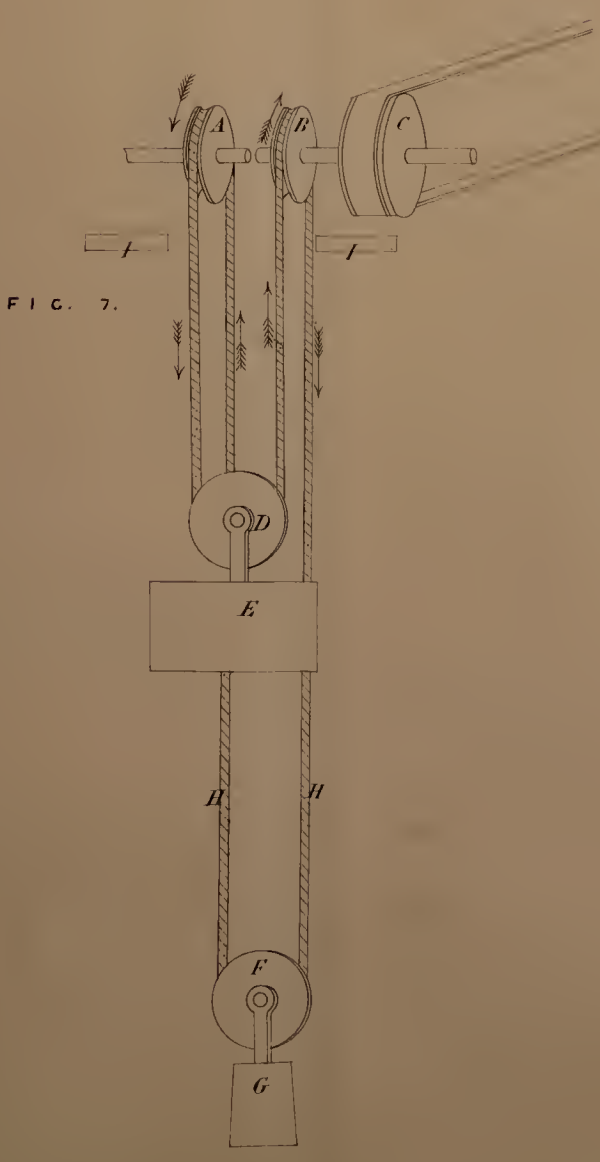


FIG. 3.

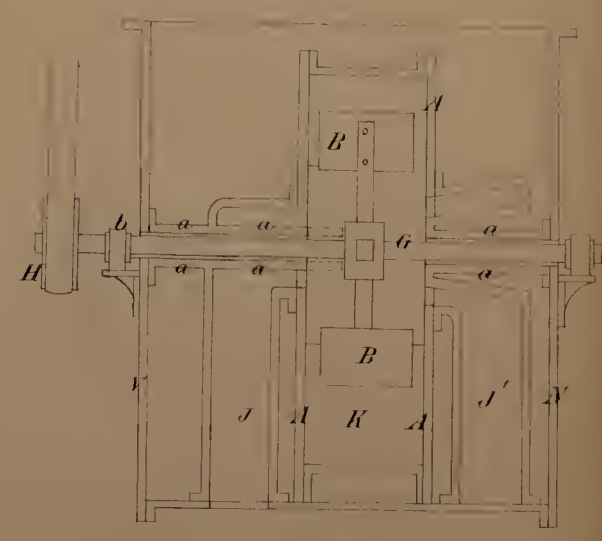


FIG. 4.





